I counted more than a hundred cocoons hanging in a small infested branch. It was a beautiful example of gregariousness and mimicry by butterfly cocoons.

ZOOLOGICAL SURVEY OF INDIA,
EASTERN REGIONAL STATION, B. K. TIKADER
SHILLONG-4, ASSAM,
July 23, 1966.

23. ON THE SEASONAL FLUCTUATIONS AND BIOLOGY OF *ANAPHOTHRIPS FLAVICINCTUS* (KARNY) ON *PANICUM MAXIMUM* IN MADRAS

(*With six text-figures*)

Studies on *Anaphothrips flavicinctus*, one of the common grass infesting species in south India and often called the 'wheat thrip' in other parts, are limited to its taxonomic position (Schmutz 1913, Karny 1919, Shumsher Singh 1942), its bionomics in relation to the wheat plant (Patel & Patel 1953) and alary polymorphism (Ananthakrishnan 1961). In view of their occurrence in considerable numbers on *Panicum maximum*, the guinea grass throughout the year, an attempt was made to observe their fluctuations in density, in relation to variations in climate involving temperature, relative humidity, rainfall and wind velocity for a period of two years, 1965-67.

For the purpose of estimating the density of the population 40 sweeps were taken as the unit of a count with each sweep not overlapping the preceding one (Cederholm 1963). Relative humidity was measured by using a hair hygrometer and the temperature with a standard centigrade thermometer, with both the instruments placed within the rows of grasses at the time of collection. Wind velocity and rainfall were obtained from the Meteorological Observatory, Nungambakkam, very near the site of investigation. The thrips collected alive were narcotised with ether vapour, counted and subsequently on activation, released on to the host. For studies of their life cycles, the individuals were reared on pot plants in the laboratory.

Both sexual and parthenogenetic modes of reproduction occur in this species. Larvae hatched from random eggs were reared and on becoming adults, the sexes were isolated and both types of reproduction studied. Adults were observed to mate 36-48 hours after emergence and copulation lasts for about five minutes. The first batch of eggs is laid 2-4 days after copulation. The time taken to lay a single egg ranges

from 5-10 minutes. Prior to oviposition, the female moves its antennae and abdomen in various directions, the abdomen subsequently arching upwards, introducing the ovipositor into the leaf tissue at an angle, and laying the eggs parallel to the veins. The parthenogenetic female was observed to have a longer oviposition period and often laid more eggs than the fertilised female. Presumably the increased longevity of the parthenogenetic female is the causal factor. The rate of oviposition during the months of January-February is 7-8 for the first 3-4 days and gradually decreases and oviposition is completed after 6-8 days. On the other hand oviposition records during the months July-August, reveal that the adults have a comparatively shorter longevity during this period and the oviposition rate is correspondingly higher. The oviposition period was also less and rate of oviposition per day high. This appears to be an adaptation to cope up with the increased temperature during these months.

TABLE 1

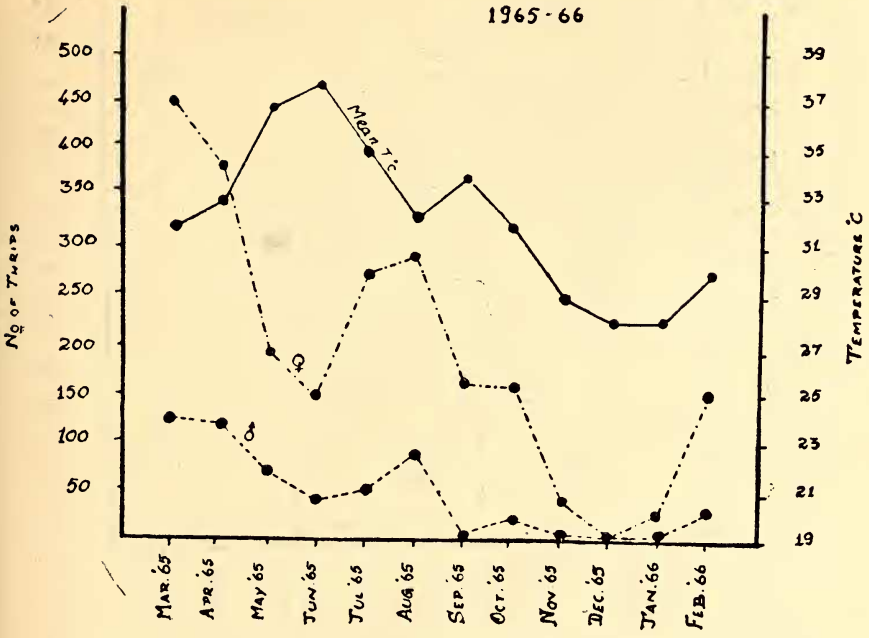
OVIPOSITION RECORDS FOR 1966

Average temperature	Type of reproduction	Pre-oviposition period	Oviposition period	Post-oviposition period	No. of eggs per day	Total eggs laid	Adult female longevity
			January-February				
25-28°C	Sexual	2-3 days	6-8 days	6-8 days	3-7	20-47	16-21
25-28°C	Parthenogenetic	3-4 days	9-10 days	6-9 days	4-8	41-56	18-23
			July-August				
33-36°C	Sexual	1-2 days	4-5 days	4-5 days	5-13	25-52	11-14 days
33-36°C	Parthenogenetic	2-3	5-6	6-7	9-13	54-65	13-16 days

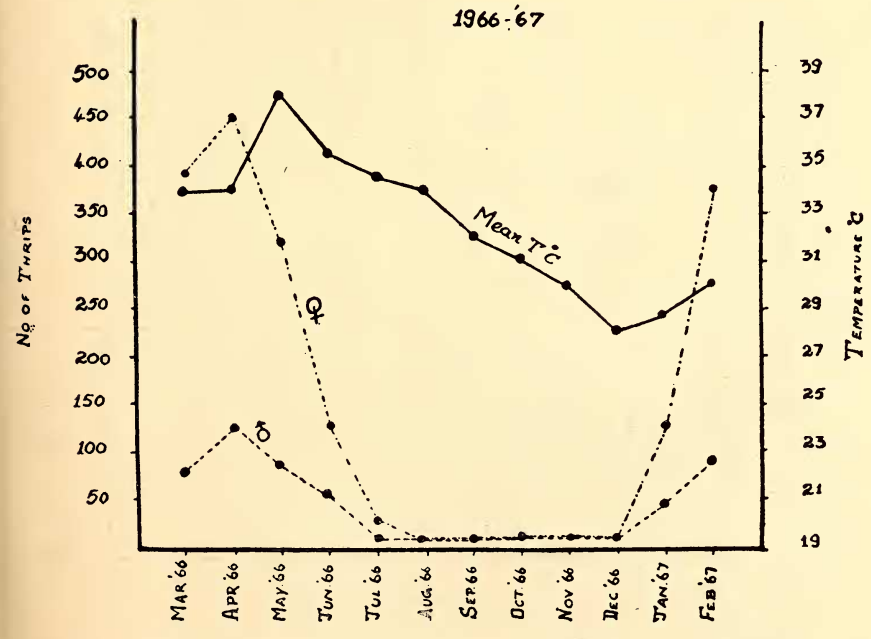
Egg mortality in either type of reproduction was almost as high as 50% and heavy mortality (50%) also occurred in the first instar larvae. All the parthenogenetically reproduced offspring were females and in the case of sexual reproduction, 92% were females.

Duration of Instars at different temperatures

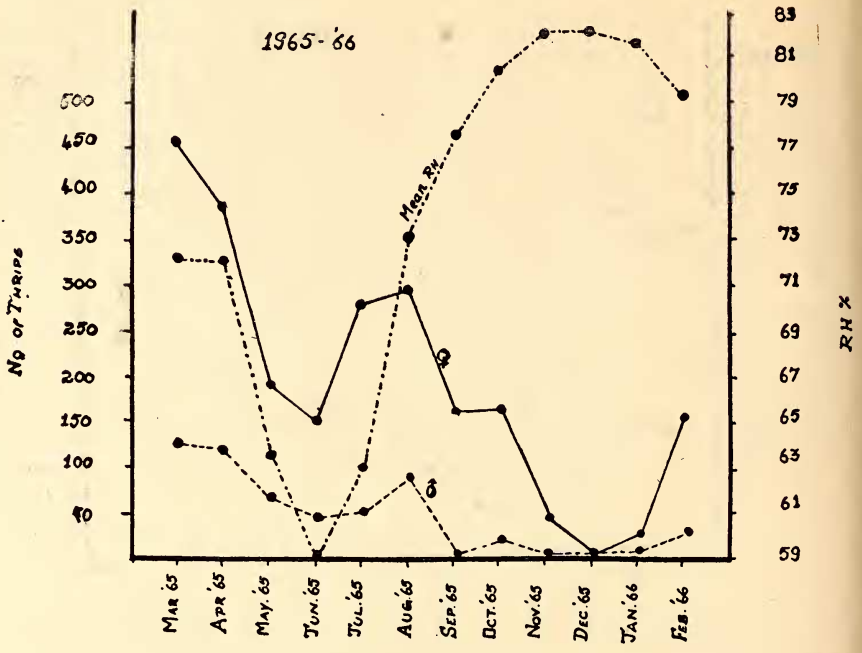
As in the case of the oviposition records, the duration of the various larval instars fell within the same range in both the sexual and parthenogenetically reproducing individuals, but it was influenced by temperature. The duration was observed to be shorter in the individuals reared in July-August when the average temperature was higher.



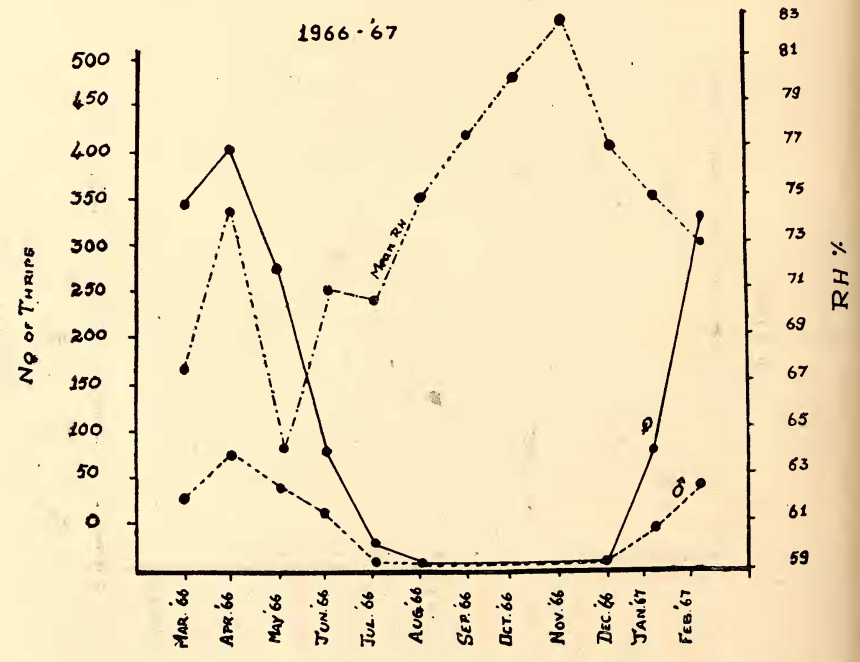
Graph I. (*a*) Fluctuations in relation to Temperature



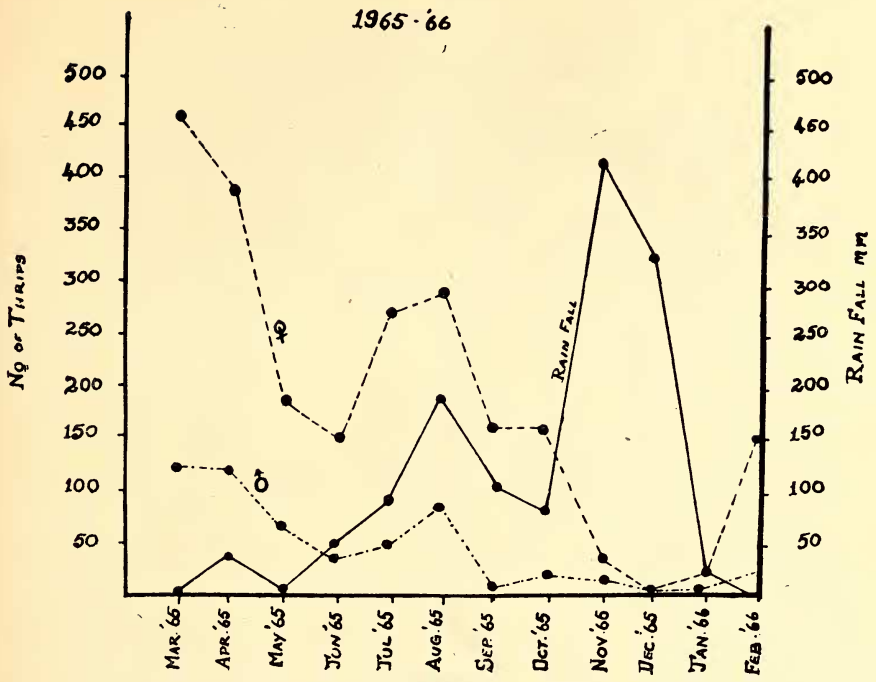
Graph I. (*b*) Fluctuations in relation to Temperature



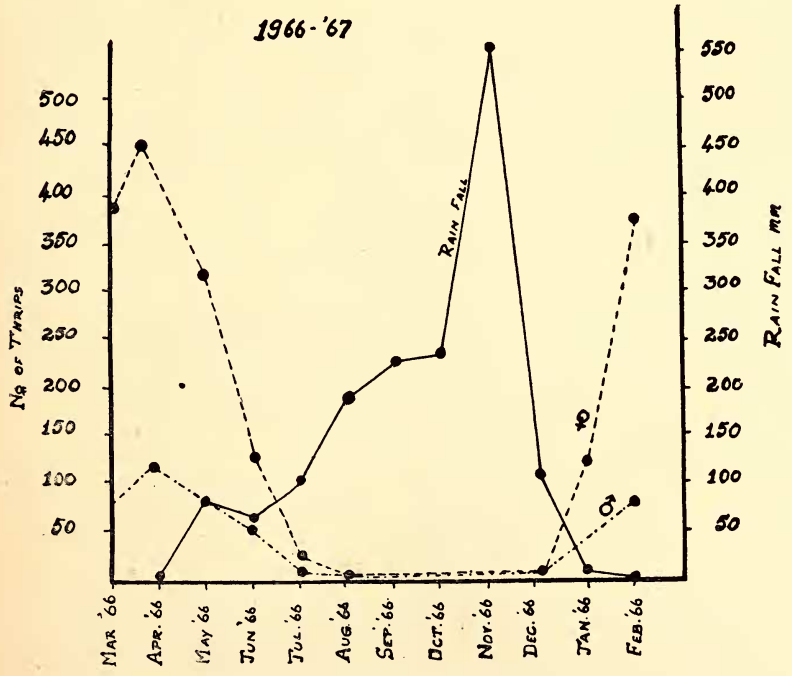
Graph II. (*a*) Fluctuations in relation to relative humidity



Graph II. (*b*) Fluctuations in relation to relative humidity



Graph III. (*a*) Fluctuations in relation to rainfall



Graph III. (*b*) Fluctuations in relation to rainfall

TABLE 2

DURATION OF LARVAL INSTARS IN 1966
(Average temperature 25-28°C)

S.No.	Stage	No. observed	Duration in days	
			Maximum	Minimum
		January-February		
1	Egg	27	9	5
2	Ist instar	14	3	2
3	IInd ,,	11	6	4
4	Prepupa	12	2	1
5	Pupa	10	4	3
		July-August		
		(Average temperature 33-36°C)		
1	Egg	21	6	3
2	Ist instar	12	3	2
3	IInd ,,	12	5	3
4	Prepupa	11	1	1
5	Pupa	11	3	1

An analysis of the density of thrips populations for the two years shows that in both the years the number of thrips was highest (400-450) during the months February-April, when the temperature range was 31-34°C, relative humidity 72-75% and rainfall is insignificant. There was a distinct fall in number (125-250) in both the years during the months May and June when the temperature range was 36-38°C, the relative humidity 59-67%. The number again showed an increase in July-August 1965 (300) when the temperature, humidity and rainfall were the same as in February-April, but it was practically negligible for the corresponding period in 1966 due to regular and increasing amounts of rainfall (150-250 mm.). During the months November-December the counts, were almost nil in both the years due to heavy rainfall (450-550 mm.) high relative humidity (80-90) and low temperature (28-29°C). As such the optimum conditions appear to be a temperature range of 31-34°C, relative humidity 72-75%, and insignificant rainfall.

LOYALA COLLEGE,
MADRAS-34
August 8, 1967.

T. N. ANANTHAKRISHNAN
A. JAGADISH

REFERENCES

ANANTHAKRISHNAN, T. N. (1961): *Proc. 1st Zoological Congress, Jabalpur.*
CEDERHOLM (1963): *Opuscula Entomological Supplementum* **22**: 215 pp.
KARNY (1919): *Marcellia* **9**: 115.
PATEL, N. G. & PATEL, G. A. (1953): *Indian J. Ent.*, **15** (3): 251-261.
SHUMSHER SINGH (1942): *Indian J. Ent.* **4** (2): 17-18.